

Conference Paper

Analysis of Research & Development Expenditures with Incomes and Expenses in Information Technology Sector of Borsa Istanbul

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Abstract

Information Technology (IT) sector consist of many areas from computers, mobile phones, tablets to wearable technologies. Nowadays, computers and phones, and all advanced products have greatly facilitated human lives. And they have provided everyone to access information from anywhere. Especially the development of the telephones in the last few years has brought a different dimension to the information technologies. Therefore, the IT sector is rapidly growing and developing over the years. As a result, IT sector has a very important place in human life day by day.

In this study, it will be discussed IT sector operating in Borsa Istanbul. They are traded 15 IT companies in Borsa Istanbul. It is examined structure of incomes and expenditures of IT firms in income statement. In addition, research & development (R&D) expenditures are analysed and they compared with other account items of income statements. The purpose of this study in Turkey is to provide information about the IT sector and financial structure. In addition, R & D expenditures of IT companies operating in Borsa Istanbul is revealed by analyzing the income statement data.

Keywords: Research & Development Expenditures, IT sector in Turkey, Financial Statement

Jel Classification Codes: M10-General, M15-IT Management, M19-Business Administration: Other, M41-Accounting

1. Introduction

In paralel to globalization, market place has turned into the rally runway and the competition has been getting harder than ever. Almost all countries are looking for a way out. This bottleneck leads especially the developing countries to economic trouble and it forces them to be one step further in global competition. The best instrument for this purpose is to focus on innovation and research & development activities. [1]

Although it is very important to make R & D investments in the production sector, it is inevitable to invest in and support information technologies in contemporary

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development. It is possible that increasing the productivity, minimization of costs and identifying and analyzing customer requirements develops information technologies sector. Countries that obtain the information in a timely and fast manner will make technological progress and make productive productions and thus reach the sustainability of economic development.

Turkey has given more importance to information and communication technology sector in recent years and began to support. The main indicator of these works is the New Incentive and R & D Law issued for investors in 2008. On the other hand, 76.3% of the households in Turkey have internet access. The proportion of Internet users in Turkey is around 61.2%. It is estimated that this ratio will exceed 65% in 2018. 2023 is the 100th anniversary of the Republic of Turkey. Turkey's targets for 2023 include the following information and communication technology sector [2]

- Increasing the number of broadband subscribers to 30 million
- Internet connection to 14 million households at 1,000 Mbps
- Increasing the sector's share in GDP to 8%
- Become one of the top 10 countries in e-transformation
- Gaining computer skills to 80% of the population
- Increasing that the number of companies operating to 5500 and the number of employees to 65,000 and exports to US \$ 10 billion in Technology Development Zones
- Increasing the size of the information and communication technologies sector by 15% annually to US \$ 160 billion
- Increase in the share of R & D expenditures in GDP from 1% to 3%

2. Assumptions and Methodology

In this study, a literature review on the IT sector has been made and national and international R & D statistics about GDP have been used. The 6-year income statements of 14 companies in the IT sector, which are listed on Borsa Istanbul, were examined one by one. Sales of these companies, R&D expenses, marketing and sales expenses, general management expenses and interest expenses were analyzed.

3. Relationship with Gdp of R&D Expenditures in the World and In Turkey

Globalization together with technology, internet, mobile systems, and developments in social media has not only affected the production process of the companies, but also affected their marketing and consumer habits. Businesses are required to have strong financial resources to adapt to this rapid change and development. For this reason, it is important to increase the share of R&D expenses in GDP. For this, R & D incentives for sectors should be increased [3]

Private sector innovation and research and development (R&D) activities substantially contribute to sustainable growth. Even a short-term decline or stagnation of these activities can have detrimental consequences in the long run. Policymakers are well aware of the importance of private sector R&D and also of the fact that private R&D spending is lower than socially desirable, even in boom periods. For that reason, public support for R&D activities is particularly important in times of an economic crisis. [4]

The R&D expenditures may be considered as an investment in new technologies, and knowledge base. And after it can be transformed into more efficient production methods for available resources [5]

Table 1 shows the R&D expenditures in GDP in some OECD countries for 2012-2017 [6]. Accordingly, Spain and the Netherlands and Turkey carries out R&D spending about the same amount. Turkey's R&D spending is more than the Balkan countries such as Greece and Romania. According to the table, the first 4 countries that make the most R&D expenditures in OECD countries are USA, China, Japan and Germany respectively. Russia's R&D expenditures are more than 2 times from Turkey.

Table 2 presents the share of R & D expenditures in total GDP. In Turkey, while this rate was at 0.8% in 2012, it was was 1% in 2017. Although, it is 1.1% in Greece and 0.5% in Romania In 2017. As for the developed countries, in 2017, the share of R & D expenditures in the GDP was as follows:

- US 2.8%
- China 2.1%
- Japan 3.2%
- Germany 3%

According to these results, Turkey should increase the share of GDP in R & D spending from 1% to 2% at least

TABLE 1: Gross domestic spending on R&D, Total, Million US dollars, 2012--2017.

Location	2012	2013	2014	2015	2016	2017
Austria	10,611	10,760	11,305	11,307	11,823	12,249
China	281,116	316,340	344,692	374,910	410,188	442,721
France	53,297	53,844	55,304	55,701	55,881	55,582
Germany	95,746	94,635	98,268	101,548	104,009	110,085
Greece	1,845	2,070	2,142	2,460	2,539	2,925
Italy	25,777	26,066	26,800	27,010	27,934	28,014
Japan	145,774	153,595	158,136	154,494	149,438	155,104
Netherlands	14,413	14,496	15,052	15,418	15,851	16,259
Norway	4,970	5,114	5,286	5,789	5,955	6,450
Poland	7,526	7,542	8,412	9,325	9,235	10,388
Portugal	3,748	3,568	3,500	3,434	3,607	3,812
Romania	1,731	1,436	1,464	1,941	2,002	2,247
Russia	34,984	35,557	37,387	37,308	37,155	38,135
Spain	18,403	17,818	17,591	17,980	18,047	18,892
Turkey	12,212	13,027	14,413	15,658	17,314	18,925
United Kingdom	37,149	38,993	40,626	41,807	42,910	43,217
United States	417,455	429,592	441,667	454,096	468,378	483,676

Source: OECD, <https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm> (Access date: March 2019)

TABLE 2: Gross domestic spending on R&D, Total, % of GDP.

Location	2012	2013	2014	2015	2016	2017
Austria	2.9	3.0	3.1	3.1	3.1	3.2
China	1.9	2.0	2.0	2.1	2.1	2.1
France	2.2	2.2	2.3	2.3	2.2	2.2
Germany	2.9	2.8	2.9	2.9	2.9	3.0
Greece	0.7	0.8	0.8	1.0	1.0	1.1
Italy	1.3	1.3	1.3	1.3	1.4	1.4
Japan	3.2	3.3	3.4	3.3	3.1	3.2
Netherlands	1.9	1.9	2.0	2.0	2.0	2.0
Norway	1.6	1.7	1.7	1.9	2.0	2.1
Poland	0.9	0.9	0.9	1.0	1.0	1.0
Portugal	1.4	1.3	1.3	1.2	1.3	1.3
Romania	0.5	0.4	0.4	0.5	0.5	0.5
Russia	1.0	1.0	1.1	1.1	1.1	1.1
Spain	1.3	1.3	1.2	1.2	1.2	1.2
Turkey	0.8	0.8	0.9	0.9	0.9	1.0
United Kingdom	1.6	1.6	1.7	1.7	1.7	1.7
United States	2.7	2.7	2.7	2.7	2.8	2.8

Source: OECD, <https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm> (Access date: March 2019)

According to Table 3, construction sector has the highest share of GDP during the period of 2010-2017. On the other hand, it was observed that the rates in the production sector were lower. It was observed GDP increases in all sectors in 2010 and 2012. As it is known, between 2010 and 2013, the US and the EU have gone into monetary expansion. Because foreign capital inflows to Turkey these years, GDP might have increased in the sectors in 2010 and 2012. However, the increase in GDP in the Information and communication sector in 2014 was extremely low. Because, after Bernanke announced that it would begin reducing monetary expansion in May 2013, it might have begun to decrease foreign inflows to Turkey. As a result, the GDP growth in 2014 felt down considerably. While the share of the IT sector increased in 2010, 2012 and 2015, it entered a declining trend in 2016 and 2017.

TABLE 3: The Share of Turkey's GDP in the Sectors (2010-2017).

Sectors	2010	2011	2012	2013	2014	2015	2016	2017
Agriculture, forestry and fishing	39.3%	-6.0%	6.8%	-8.6%	-3.9%	15.4%	-9.7%	-4.9%
Manufacturing	25.0%	12.4%	9.3%	7.7%	1.4%	9.6%	0.1%	2.2%
Water supply, sewerage, waste management and remediation activities	30.3%	-0.7%	18.0%	4.7%	-4.6%	1.5%	0.1%	-2.8%
Construction	36.1%	21.2%	18.3%	13.5%	-1.4%	10.8%	5.9%	-3.4%
Trade, Transport and Accomodation	22.4%	4.5%	16.1%	4.3%	0.1%	9.6%	-2.3%	-0.1%
Information and communication	13.5%	-2.9%	17.7%	4.4%	-0.6%	9.3%	2.2%	0.1%
Financial and insurance activities	-1.5%	-5.2%	23.1%	10.4%	-8.4%	14.6%	12.4%	-6.2%
Real estate activities	18.5%	-6.8%	9.2%	0.4%	-4.5%	6.2%	0.8%	-10.3%
Professional, Administrative and Support Service Activities	20.2%	3.6%	18.5%	9.1%	2.3%	18.1%	2.1%	-0.2%
Public Administ., Education, Human Health and Social Work Activities	22.0%	-1.7%	16.2%	2.6%	-0.3%	7.1%	7.0%	-9.0%
Other service activities	25.4%	2.9%	13.2%	8.6%	-0.4%	4.6%	1.3%	-6.0%
Taxes-Subsidies	40.1%	2.6%	10.7%	11.2%	-8.6%	13.3%	0.7%	-7.3%

Source: TUIK, <http://www.tuik.gov.tr> (Access date: March 2019)

Table 4 shows the GDP amount in terms of euro by sectors. Accordingly, the information and communication sector regularly increased every year except for the GDP of 2014. The GDP of this sector has ranged from 12.6 billion to 19 billion euro. The average annual amount of GDP is 16,441,243,000 euro. This amount corresponds to an average

TABLE 4: Gross Domestic Product (At Current Basic Prices for Thousands Euro).

Sectors	2009	2010	2011	2012	2013	2014	2015	2016	2017
Agriculture, forestry and fishing	37,783,383	52,641,345	49,456,576	52,818,096	48,249,387	46,360,889	53,495,002	48,294,796	45,918,410
Manufacturing	70,435,535	88,072,762	98,974,063	108,181,821	116,505,155	118,136,555	129,488,536	129,634,612	132,502,550
Water supply, sewerage, waste management and remediation activities	15,242,824	19,862,160	19,715,572	23,256,122	24,352,008	23,221,331	23,580,964	23,600,630	22,949,789
Construction	26,119,520	35,546,160	43,073,369	50,969,246	57,842,780	57,004,343	63,160,774	66,875,099	64,620,371
Trade, Transport and Accommodation	101,101,701	123,785,491	129,394,884	150,168,609	156,610,358	156,727,147	171,821,256	167,933,976	167,735,129
Information and communication	12,633,505	14,336,772	13,920,170	16,390,291	17,109,083	17,000,738	18,579,067	18,995,635	19,005,923
Financial and insurance activities	17,423,019	17,155,141	16,263,346	20,014,882	22,091,748	20,239,791	23,195,036	26,066,761	24,460,130
Real estate activities	48,760,469	57,788,324	53,840,853	58,793,112	59,057,373	56,384,040	59,881,059	60,347,687	54,119,004
Professional, Administrative and Support Service Activities	20,700,709	24,879,138	25,775,475	30,543,430	33,323,157	34,084,110	40,254,447	41,106,112	41,032,085
Public Administrat., Education, Human Health and Social Work Activities	55,221,547	67,379,424	66,225,619	76,978,783	79,003,316	78,794,315	84,422,630	90,306,923	82,203,792
Other service activities	9,034,732	11,328,825	11,652,864	13,193,232	14,329,404	14,273,154	14,933,286	15,130,124	14,219,057
Taxes-Subsidies	50,283,450	70,439,128	72,257,235	79,973,675	88,954,610	81,306,236	92,087,708	92,703,379	85,980,298
GDP (Purchaser's Prices)	464,740,394	583,214,670	600,550,028	681,281,300	717,428,379	703,532,648	774,899,766	780,995,733	754,746,538

Source: TUIK, <http://www.tuik.gov.tr> (access date: March 2019)

of 2.4% in all sectors. It is useful to pay attention to this point. Because exchange rates in Turkey before 2016 was low, a rate of 2.4% may have occurred.

When the Global Competitiveness Reports are examined from 2012-2018 [7], table 5 will be reached, announced by the World Economic Forum. The World Economic Forum (WEF) has published the Global Competitiveness Report, which has been ranked by its competitiveness, since 1979. Global Competitiveness Report series have been providing policy-makers and other stakeholders around the world with an annual assessment of the drivers of long-term growth. At the heart of the competitiveness agenda is the recognition that economic growth is a core driver of human development [8]

WEF uses qualitative indicators obtained from international sources and qualitative indicators obtained from the Manager Opinion Survey data. Quantitative indicators are indicators of data such as inflation rate, public debt and internet access rate of countries. Qualitative indicators are obtained as a result of surveys conducted with company managers. These indicators are information on institutional factors such as judicial independence, the existence of corruption. In calculating the index, three main factors are used, consisting of 12 components and complementary data. The first basic factor is the **Basic Requirements**, which consist of Institutions, Infrastructure, Macroeconomic Environment, Health and Basic Education. Secondly, **Productivity Improving Factors** is the combination of Higher Education and Vocational Training, Efficiency of Goods Market, Efficiency of Labor Market, Financial Market Development, Technological Preparation and Market Size. The last factor is the **Innovation and Diversity Factors** that cover the Development Level of the Labor Market and Innovative Data. [9]

TABLE 5: Turkey's Rank in almost 140 Countries on The Global Competitiveness.

Years	Rank in almost 140 Countries
2012-2013	43
2013-2014	44
2014-2015	45
2015-2016	51
2016-2017	55
2018	61

Source: World Economic Forum, The Gloal Competitiveness Reports, 2012-2016

According to table 5, in 140 countries, Turkey's competitiveness ranking has been in a downtrend since 2012-2013. Although Turkey is the forty-third in 140 countries in 2012-2013, it's ranking orderly continued to fall and in 2018 it has placed to ranking sixty-first.

4. Empirical Relation Between R&D and Economic Growth

There are three important factors supporting economic growth: (1) Capital accumulation, such as all new investments in land, physical equipment, and human resources, (2) Growth in the labor force, and (3) Technological Progress. Recently, new growth theories have stressed the importance of technological change as a source of economic growth. These theories support the view that the key driver for economic growth in global economies is innovation. Also, many studies have researched the extent of the contribution that innovation continues to have upon competitiveness and the growth of firms, industries, and national economies [10] The R&D expenditures may be considered as an investment in new technologies, and knowledge base. And after it can be transformed into more efficient production methods for available resources [5]

Growth rates of virtually all economic variables are time varying. The reasons for these fluctuations are manyfold. Companies that spend R & D and target profit maximization may be the source of long-term positive growth rates of countries [11.] There are many the following studies that trying to explain the relationship between investment in R&D and growth [10]

- Hall (1996) showed in his article that investment in R&D is positively correlated with firms' profitability and productivity, and produces a relatively high private rate of return.
- Scherer (1982), Griliches and Lichten erg (1984), Aghion and Howitt (1998), and Zachariadis (2003) present strong evidence that R&D investment and growth are positively related in the US economy
- Sadraoui and Zina, (2009) examined the dynamic relationship between cooperation in R&D and economic growth by using the Generalised Moment Method and panel data from a sample of 23 countries between 1992 and 2004. Results showed a positive and significant relation between R&D cooperation and economic growth for all the countries sampled.
- Griffith, Redding and Van Reenen (2004) claimed that research and development (R&D) has two faces. The first face is in stimulating innovation. Second face is in making easy the imitation of discoveries by others. They researched this two faces empirically using a panel of industries across twelve OECD countries. They found that R&D is statistically and economically important in both technological and innovation.

- Further, Wakelin (2001) analyzed relationships between productivity growth and R&D expenditures in 170 firms on the UK stock market. The research findings showed that a has a positive and significant role in influencing its productivity growth.
- Samimi and Alerasoul (2009) researched the impact of R&D on economic growth in developing countries. They used a sample of 30 developing countries for which the necessary data is available for the period 2000 to 2006. According to their analyses, the low R&D expenditures of developing countries have no important effect on economic growth.
- Bayarcelik and Tasel (2012) determined that there was a positive and significant relationship between R&D investment and number of the employees in the R&D department with GDP

Ozcan et al (2014) examine that the relationship between R&D expenditures and economic growth is analyzed for the selected 15 OECD countries from 1990-2011 within the framework of panel data model. According to this analysis, R&D expenditures positively affects economic growth. (12) On the other hand, in a study, which researches the relationship between R&D expenditures and economic growth, the Johansen Co-integration Test and the Granger Causality Test are applied by using the data covering the period of 1990 to 2013 in Turkey. As a result of the tests conducted, it is concluded that there is no long-term relationship between real R&D expenditures and economic growth series. [5]

Conversely from the related universal literature, it is concluded that there is no relationship between R&D expenditures and economic growth as a result of the empirical tests applied. This case can be explain that Turkey is a developing country, and the investment volumes allocated to R&D expenditures show considerable increases in recent decades. Thus, the R&D activities need a long-term technical effort, and the benefits of those expenditures distributed in this area can be seen in the economy in a period of next 20 or 35 years. [5]

5. Analyzing of R&D and the Other Expenses of Turkish Information Technology Companies in Borsa Istanbul

In this section, R & D expenses and other expenses of IT companies registered in Borsa Istanbul will be examined. As I explained in the study, there is a positive relationship with R & D expenditures and growth rates of countries. However, in another study

conducted as for Turkey, (5) R & D expenditure has been determined that there is no positive relationship between growth rates. They argued that Turkey 's is a developing country, while the results of R & D spending will emerge after many years not in a short time.

Aytekin and Ozcalik [13] researched to determine the relationship between R&D expenditures and the financial performance of companies. For this purpose, R&D and performance data of 7 companies which are continuously listed in Borsa Istanbul Technology and Information Technology Indices between 2011:Q1 - 2018:Q1 have been used. According to researchers, they found a positive relationship between EBIT and R & D Expenditures and Market Value / Book Value. In addition, although they determined a positive correlation between Net Sales and R & D Expenditures, a negative significant relationship was found between R & D / Total Operating Expenses. [13]

Dağlı and Ergün (2017) analyzed the R & D expenditures of 66 manufacturing firms in Borsa Istanbul between 2010-2013. Accordingly, a positive relationship was found between R & D expenditures and ROA. In addition, expenditures on R & D activities affect the ROA with a delay of one year. As the new R & D expenditures increase, the profitability of the companies is increasing. This increase in the profit is realized one year after the expenditure. [14]

In 2018, Aytekin and Ozcalik [13] conducted a new study on the relationship between R & D expenses and financial performance. Therefore, the relationship between R & D expenses and financial performance is not researched in this study. The aim of this study is to show the revenues, the cost of sales, R & D Expenses, Marketing and Sales Expenses, General Management Expenses, Financing Expenses and Operating Profits of IT companies in Borsa Istanbul. Thus, it will be easily determined the share of IT companies' income and expenses. In my opinion, it would be useful to determine whether IT companies made R & D expenditures or which IT companies spent R & D expenditures in Borsa Istanbul.

Except for the Borsa Istanbul, Turker et al [3] realized a similar research for other companies in Turkey. Susmus, Caki and Can researched statements of income of 1289 small-size manufacturing enterprises, 876 medium-sized manufacturing enterprises and 571 large-scale manufacturing companies about R & D expenses. The aim of their analysis was to determine the proportion of R & D expenses in sales and in operating expenses of the manufacturing enterprises. According to their research; [3]

- The rate of R&D expenses to the net sales is 0.22 % in small-sized Manufacturing enterprises in 2014

- The rate of R&D expenses to the net sales is 0.15% in medium-sized Manufacturing enterprises in 2014
- The rate of R&D expenses to the net sales is 0.40% in large-sized Manufacturing enterprises in 2014

As can be seen from Table 6, there are 14 IT Sector companies in Borsa Istanbul. The income and expenses of these companies for the years 2013-2018 are presented in detail in Euro as yearly average in the table below. Determinations for companies are as follows:

- The average annual sales of companies range from 2,2 million euros to 915 million euros.
- Half of the 14 companies did not spend R & D. R & D expense in Borsa Istanbul IT sector is 1,85 million euro per company yearly
- The average annual R & D expenditure in the sector is 26 million euros.
 - Interest expenses of all companies in the IT sector are twice as much as R & D expenses. Accordingly, the total interest costs is 48,7 million euros.
 - IT sector total annual administrative expenses is 51,1 million euro, marketing and sales expenses are 55,2 million euros.
- The average annual sales of companies ranged from 2.2 million euros to 915 million euros.
- The company that makes the highest R & D expenditure in the sector is LOGO SOFTWARE and it has the highest profit in the sector.

Table 7 shows the ratio of the expenses of the companies to the sales and the ratio of the profits to the sales. According to Table 7, the following results are possible:

- R & D expenses / sales ratio in the sector is 1%. However, half of the companies in the sector do not have R & D activities. When only 7 companies, which have R & D activity, are examined, R & D Expenses / Sales ratio is 8.8%
- General Management Expenses / Sales ratio in the sector is 2%
- Marketing and Sales Expenses / Sales ratio in the sector is 2.2%
- Interest Expenditures / Sales ratio in the sector is 1.9%
- The cost of sales / sales in the sector is 90.9%. The IT sector is a labor-intensive sector with high labor costs. Because the software companies generally pay high wages to engineers

TABLE 6: Information & Technology Companies in Borsa ISTANBUL.

	Sales	Cost Of Sales	Gross Profit	General Management Expenses	Marketing and Sales Expenses	R & D Expenses	Interest Expenses	EBIT	Rate of EBIT in Total Sector
Alcatel Lucent Teletaş	121,483,451	104,237,648	17,245,803	5,130,480	2,417,400	2,991,754	1,147,543	5,558,625	11.4%
Arena Computer	432,303,354	405,568,130	26,735,224	8,671,341	7,926,733	0	4,273,308	5,863,842	12.0%
Armada Computer	285,554,840	269,917,707	15,637,133	4,695,616	4,052,848	0	4,101,031	2,787,638	5.7%
Despec Computer	58,914,858	53,687,095	5,227,764	1,262,953	1,045,572	0	1,204,302	1,714,937	3.5%
Datagate Computer	242,615,185	234,411,816	8,203,369	1,474,222	1,241,048	0	863,018	4,625,081	9.5%
Fonet Information Technology	6,029,331	3,544,801	2,484,530	919,107	182,478	33,440	191,873	1,157,633	2.4%
Index Computer	915,452,973	874,416,440	41,036,533	9,849,690	7,962,915	0	11,720,793	11,503,134	23.5%
Karel Electronic	93,972,434	69,991,734	23,980,701	2,099,009	5,165,089	5,530,433	12,041,932	-855,762	-1.7%
Kafein Software	17,246,709	11,842,119	5,404,590	1,486,510	72,006	634,385	363,720	2,847,969	5.8%
Kron Telecommunication	5,691,617	1,470,890	4,220,728	649,038	1,071,246	1,118,885	366,152	1,015,406	2.1%
Link Computer	2,211,456	547,083	1,664,373	682,000	553,317	296,407	142,491	-9,842	0.0%
Logo Software	47,074,012	3,618,930	43,455,082	5,624,089	10,305,915	14,388,052	1,407,914	11,729,114	24.0%
Netas Telekom	264,380,716	231,681,652	32,699,064	7,611,108	13,184,211	904,791	10,771,073	227,881	0.5%
Plasticcard	25,799,862	23,826,130	1,973,732	1,011,141	89,965	0	123,531	749,095	1.5%
Total	2,518,730,800	2,288,762,174	229,968,626	51,166,306	55,270,742	25,898,148	48,718,679	48,914,751	100.0%

Source: Constituted from me by using <http://finans.mynet.com/> and data have been converted into Euro (15)

TABLE 7: All Expense Rate in Sales of Information & Technology Companies in Borsa ISTANBUL.

	Rate of R&D Expenses	Rate of GM Expenses	Rate of M&S Expenses	Rate of Interest Expenses	Rate of Cost of Sales	Rate of EBIT
Alcatel Lucent Teletaş	2.5%	4.2%	2.0%	0.9%	85.8%	4.6%
Arena Computer	-	2.0%	1.8%	1.0%	93.8%	1.4%
Armada Computer	-	1.6%	1.4%	1.4%	94.5%	1.0%
Despec Computer	-	2.1%	1.8%	2.0%	91.1%	2.9%
Datagate Computer	-	0.6%	0.5%	0.4%	96.6%	1.9%
Fonet Information Technology	0.6%	15.2%	3.0%	3.2%	58.8%	19.2%
Index Computer	-	1.1%	0.9%	1.3%	95.5%	1.3%
Karel Electronic	5.9%	2.2%	5.5%	12.8%	74.5%	-0.9%
Kafein Software	3.7%	8.6%	0.4%	2.1%	68.7%	16.5%
Kron Telecommunication	19.7%	11.4%	18.8%	6.4%	25.8%	17.8%
Link Computer	13.4%	30.8%	25.0%	6.4%	24.7%	-0.4%
Logo Software	30.6%	11.9%	21.9%	3.0%	7.7%	24.9%
Netas Telekom	0.3%	2.9%	5.0%	4.1%	87.6%	0.1%
Plasticcard	-	3.9%	0.3%	0.5%	92.3%	2.9%
Total	1.0%	2.0%	2.2%	1.9%	90.9%	1.9%

- The EBIT / Sales ratio of the IT sector is 1.9%
- The companies with the highest R & D expenses in the sector are KRON TELECOMMUNICATION and LOGO SOFTWARE. These two companies are also the first two companies with the highest profitability in the sector. Accordingly, the two companies that have a high R & D expenditure also have the highest profitability.
- There are 2 companies in the industry that have loss: LINK COMPUTER AND KAREL ELECTRONIC. In addition, these two companies also pay the highest interest expenses.

When Table 8 is analyzed, the sales in the sector was realized the same amount between the years 2015-2018. In 2018, sales decreased by 29% compared to 2017. This result may have arisen in 2018 because exchange rates (Euro/TL) rose more than in previous years. Eyuboglu and Eyuboglu (2018) found their research that the increase in the USD / TL exchange rate had a statistically significant and negative effect on the IT sector. [16]

When Table 9 is examined, it is observed that the companies that have more hardware sales do not spend R & D, but the companies that work on software make R

TABLE 8: Sales of Information & Technology Companies in Borsa ISTANBUL (Euro).

	2013	2014	2015	2016	2017	2018
Alcatel Lucent Teletaş	141,100,800	128,625,047	109,458,448	131,904,573	120,243,874	97,567,963
Arena Computer	399,352,634	424,375,191	468,762,502	467,859,153	443,084,848	390,385,798
Armada Computer	213,521,374	252,564,263	307,246,216	312,722,754	324,820,955	302,453,476
Despec Computer	56,057,334	56,690,815	58,454,963	57,771,416	63,323,879	61,190,742
Datagate Computer	62,415,441	156,408,962	356,984,923	363,598,955	384,588,828	131,694,000
Fonet Information Technology					5,752,062	6,306,601
Index Computer	640,346,629	759,125,715	1,121,501,286	1,135,809,177	1,146,653,240	689,281,791
Karel Electronic	72,345,217	75,045,775	84,793,995	96,365,457	106,482,313	128,801,849
Kafein Software						17,246,709
Kron Telecommunication	3,921,585	4,643,063	4,828,345	8,154,525	6,665,461	5,936,724
Link Computer	2,163,529	2,213,482	2,524,843	2,139,360	2,191,904	2,035,620
Logo Software	28,040,149	35,798,567	42,669,777	56,998,235	62,237,345	56,700,000
Netas Telekom	250,341,218	254,975,610	334,325,082	290,372,283	272,659,301	183,610,803
Plasticcard	25,199,664	20,079,167	24,387,156	24,846,816	30,485,060	29,801,311
Total Sales	1,894,805,575	2,170,545,657	2,915,937,535	2,948,542,703	2,969,189,071	2,103,013,385

Source: Constituted from me by using <http://finans.mynet.com/> and data have been converted into Euro

& D expenditures. While the R & D expenditures of the IT sector increased regularly until 2017, R & D expenditures decreased by 28.4% in 2018. (Fonet Information Technology registered to Borsa Istanbul in 2017 and Kafein Software registered to it in 2018)

Table 10 was formed from the data in Table 8 and 9. KAFEIN has 1 year data because it joined Borsa Istanbul in 2018. When Table 10 is analyzed, KRON, LOGO and LINK have the lowest annual sales share in IT sector, but these 3 companies have the highest R & D expenditure in IT sector. The total sales of these three companies in the IT sector was $3.76\% + 0.23\% + 1.88\% = 5.87\%$. The ratio of these three companies in total

TABLE 9: R&D Expenses of Information & Technology Companies in Borsa ISTANBUL (Euro).

	2013	2014	2015	2016	2017	2018
Alcatel Lucent Teletaş	2,548,777	2,688,662	3,693,369	3,280,423	3,443,602	2,295,693
Fonet Information Technology					64,060	2,820
Karel Electronic	4,125,583	5,784,757	5,947,160	5,714,454	6,276,426	5,334,217
Kafein Software						634,385
Kron Telecommunication	494,715	822,139	1,118,445	1,395,970	1,645,037	1,237,005
Link Computer	317,122	296,149	296,463	297,113	297,605	273,992
Logo Software	6,780,331	10,072,522	12,209,168	17,774,891	24,780,688	14,710,709
Netas Telekom	285,603	427,566	1,314,868		1,033,158	2,367,552
Total R&D Expenses	14,552,132	20,091,796	24,579,473	28,462,851	37,540,576	26,856,373

Source: Constituted from me by using <http://finans.mynet.com/> and data have been converted into Euro

TABLE 10: Sales and R & D Expenditures in IT Sector Between 2013 and 2018.

Companies	Rate of Sales in Sector Total Sales	Rate of R&D Expenses in Sector Total R&D Expenses
Alcatel Lucent Teletaş	4.86%	-
Arena Computer	17.29%	11.80%
Armada Computer	11.42%	0.04%
Despec Computer	2.36%	-
Datagate ComputerTechnology	9.70%	-
Fonet Information Technology	0.08%	-
Index Computer	36.61%	-
Karel Electronic	3.76%	21.82%
Kafein Software	0.11%	0.42%
Kron Telecommunication	0.23%	4.41%
Link Computer	0.09%	1.17%
Logo Software	1.88%	56.76%
Netas Telekom	10.57%	3.57%
Plasticcard	1.03%	-
Total	100%	100%

R & D expenses within the IT sector is $21.82\% + 4.41\% + 56.76\% = 83\%$. Here is a very

interesting result. Although these 3 companies have the lowest sales share, they cover 83% of all R & D expenses in the sector. When the activities of these three companies are analyzed, it is understood that they operate completely on software technologies.

6. Conclusion

It is mentioned firstly relationship with GDP of R&D expenditures in the world and in Turkey. Then, it is explained the share of Turkey's GDP according to Sectors. It is mentioned firstly relationship with GDP of R&D expenditures in the world and in Turkey. Then, it is explained the share of Turkey's GDP according to Sectors. In many studies, a positive relationship was found between the growth rates of countries and R & D expenditures. In this study, income statements of 14 IT Sector companies operating in Borsa Istanbul were analyzed. According to the results, the R & D expenses / sales ratio of the sector is 1%. Half of the companies in the sector are spending R & D. Companies with more hardware sales do not spend R & D. However, companies working on software are spending on R & D. R & D Expenditures / Sales of 7 companies engaged in R & D are 8,8%. General Management Expenses / Sales ratio of the sector is 2%, Marketing and Sales Expenses / Sales ratio is 2.2%. R & D Expenses / Sales ratio in the sector should be increased to at least 3%. On the other hand, the sector's EBIT / Sales ratio is 1.9%, which is quite low. It was observed that there was a lack of financing in the sector. Interest Expenditure / Sales ratio is 1.9% and this ratio is about 2 times the R & D expenses / Sales ratio. IT sector companies need to reduce interest expenses in order to have a high level of competitiveness. The cost of sales / sales

is 90.9% because software engineers work at high wage rates. IT sector companies should increase their exports. While the sales in the sector were the same between 2015-2018, it decreased by 29% in 2018. Similarly, the R & D expenditures of the sector increased steadily until 2017, while they decreased by 28.4% in 2018. Due to the fact that Turkey in the Euro / TL rate was increase in high amounts, these results may have arisen in 2018. This is very interesting results that although these 3 companies have the lowest sales (%5,87) share, they cover 83% of all R & D expenses in the sector. It determined that these three companies work about software technologies. In this paper, the last 6 years of IT sector firms operating in Borsa Istanbul are examined. In recent years, IT sector has started to give more importance to R & D projects. Therefore, this paper is thought to be a guide for other future studies on R & D expenditures for IT sector.

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